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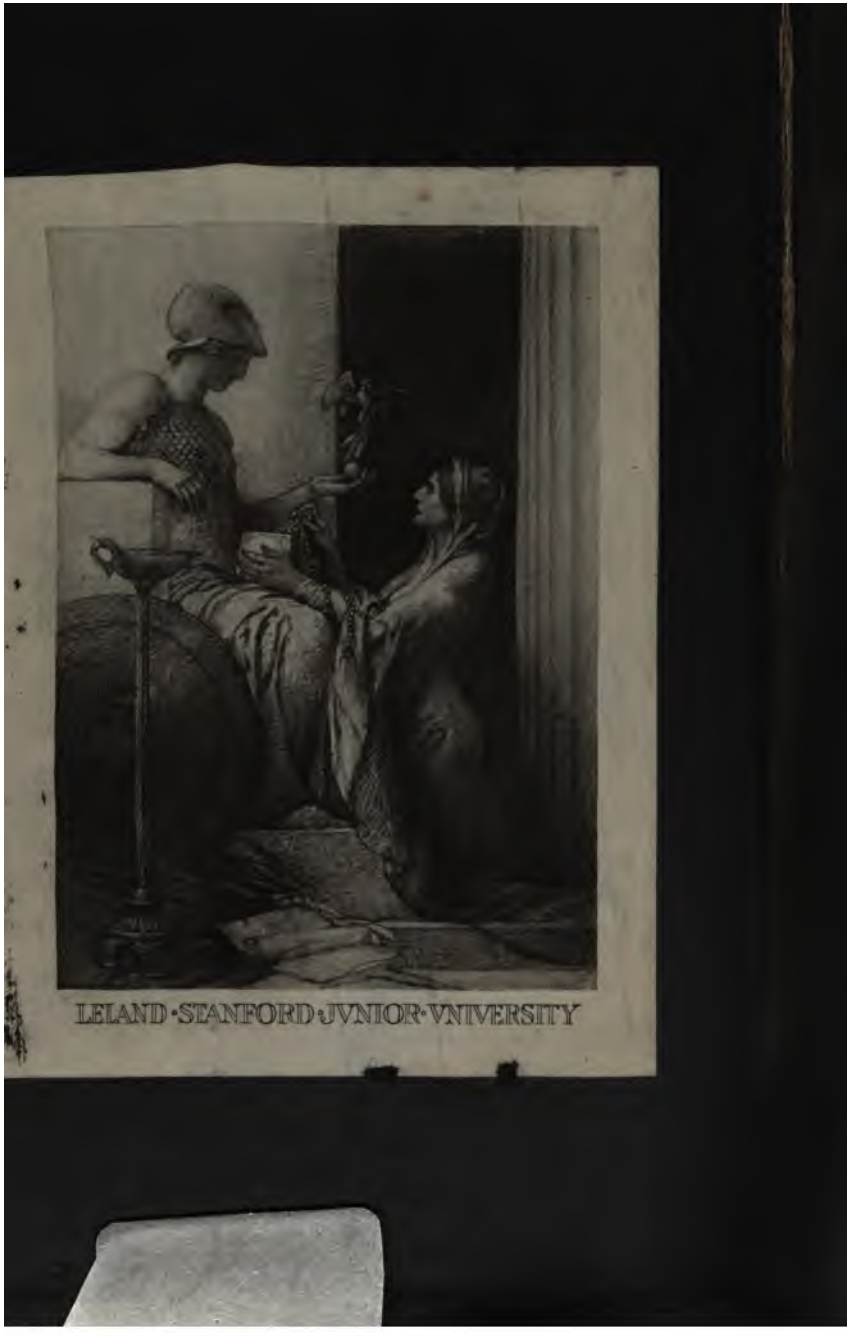
NATIONAL LIFE
FROM THE STANDPOINT OF SCIENCE

KARL PEARSON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NATIONAL LIFE

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NATIONAL LIFE

FROM THE STANDPOINT OF SCIENCE

An Address delivered at Newcastle, November 19, 1900

BY

KARL PEARSON, F.R.S.

PROFESSOR OF APPLIED MATHEMATICS, UNIVERSITY COLLEGE, LONDON

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To

W. F. R. WELDON, F.R.S.,

Linacre Professor of Comparative Anatomy
in the University of Oxford.

A SLIGHT TOKEN OF GRATITUDE
FOR ALL THAT I HAVE LEARNT FROM HIM
DURING THE YEARS OF OUR FRIENDSHIP.

NOTE.

THIS address was delivered in Newcastle on November 19, to the members of the Literary and Philosophical Society, and the substance of it at a somewhat later date to past and present engineering students of University College, London. There are points in the address which seem to me to need consideration at the present time from a somewhat wider audience, and in the hope of inciting those of my countrymen who are working for the reorganization of the nation to consider more closely these problems, I now venture to publish it.

K. P.

NATIONAL LIFE

FROM THE STANDPOINT OF SCIENCE

In the fore-part of this year, when I was asked to give a lecture at Newcastle, the minds of men were not inclined to be interested in the fascinating problems of pure science. The spirits of one and all, whatever their political party or their opinions on the rights or wrongs of British action in South Africa might be, were depressed in a manner probably never before experienced by those of our countrymen now living. We can, in the light of what has happened since, afford, perhaps, to admit the truth now. We had been defeated, I may even venture to say badly defeated, by a social organism far

less highly developed and infinitely smaller than our own. We felt like the giant bewildered, not by the strength, but by the skill and ingenuity, of our opponent. We had lost the power of foreseeing, and our soldiers the power of adapting themselves to a change of environment. We had to learn from our foe the very armament suitable to the conditions; we had to learn that guns of great calibre could be taken into the field and, what is more, withdrawn from it; we had to learn the arts of making and of taking shelter; we had to learn the existence of something which was neither cavalry nor mounted infantry; we, a nation of horse-breeders and horse-riders, had to learn the right horse for a rough country and the right manner of handling him; nay, to some troops we even issued a new rifle, and let them practically gain their first experience of it in the field. We, no doubt, felt in those days of depression that we should learn, or partially learn, all this, and perhaps more; we hoped, with a distinguished statesman, that we should 'muddle through somehow.' We refrained, if not completely,

yet fairly successfully, from making scapegoats.

But those who saw beyond the immediate national danger were filled with a more abiding sense of risk. They recognised that the struggle for existence among nations will not necessarily be settled in favour of the biggest nation, nor in favour of the best-armed nation, nor in favour of the nation with the greatest material resources. I speak not only of war, but of the more silent, but none the less intense, struggle of peace—the struggle for trade, for commercial supremacy, for new sources of food supply, for mineral wealth, and for the raw materials of manufacture. Size and armament and material prosperity, of course, all tell; hardihood, bravery, and endurance all tell too, although not so overwhelmingly as in the days of Queen Bess. But none of these alone will suffice. Here are the flesh, blood, and sinews of a nation, but to make it foremost in the struggle, to make it a homogeneous, highly-organized whole, you must have a complex nervous system, the reflex actions of which are not merely automatic, but under

the control of that classified experience which we term wisdom.

We all know how to act in our wonted circumstances, under our usual environment: our reactions are almost automatic; but given new circumstances and an unusual environment, then prompt action means foresight, training, that rapid application of the truths learned from past experience to new facts which from various standpoints in life we call ingenuity, business-habit, scientific insight, wisdom, or, even more comprehensively, *brains*. What is here said of an individual is true of a nation. The nation, however prosperous, however hardy, however big, will fail when it comes to a crisis, when it is suddenly placed in a new environment, unless it has organized brain-power controlling its nervous system right away to the smallest outlying points. Hardihood, big battalions, command of the purse, may enable us to struggle through in either peace or war so long as we have only to meet small or semi-organized opponents, but they will not avail when great nation meets great nation; then it is the codified experience

and the organized brain-power which tell in the struggle.

It was consciousness of this lack of real insight—not in one, but in many departments of national life—which gave an abiding gloom to the depression arising from our difficulties at the commencement of the year. It was not only the need of 'somehow muddling through' this matter, but the problem of how we were to provide against graver crises in the future, which depressed many. How was the nation's own fault to be brought home to it? How could it become a more highly-organized whole, profiting to the full by such brains as our race possesses? Such thoughts as these, rather than the purely intellectual problems of science, filled my mind when your invitation to lecture in Newcastle reached me, and they led me more or less directly to try and emphasize the national value of science.

From the standpoint of science there are two questions we can, or, rather, we *must*, ask. First: What, from the scientific standpoint, is the function of a nation? What part from the natural history aspect does the

national organization play in the universal struggle for existence? And, secondly, What has science to tell us of the best methods of fitting the nation for its task?

To answer the latter question at all effectually, we must first consider what is the proper answer to be given to the former. I shall therefore endeavour to lay in broad outlines before you what I hold to be the scientific view of a nation, and of the relationship of nations to each other. If at the very offset my statements strike you as harsh, cold, possibly immoral, I would ask you to be patient with me to the end, when some of you may perceive that the public conscience, the moral goodness which you value so highly, is established by science on a firmer and more definite, if a narrower, foundation than you are wont to suppose.

I want you to look with me for awhile on mankind as a product of Nature, and subject to the natural influences which form its environment. I will, first, notice a point which bears upon man as upon all forms of animal life. The characters of both parents—their virtues, their vices, their capabilities,

their tempers, their diseases—all devolve in due proportion upon their children. Some may say, 'Oh yes; but we know such things are inherited.' I fear that the great majority of the nation does not realize what inheritance means, or much that happens now would not be allowed to happen. Our knowledge of heredity has developed enormously in the last few years; it is no longer a vague factor of development, to be appealed to vaguely. Its intensity in a great variety of characters in a great many forms of life has been quantitatively determined, and we no longer stand even where we did ten years ago. The form of a man's head, his stature, his eye-colour, his temper, the very length of his life, the coat colour of horses and dogs, the form of the capsule of the poppy, the spine of the water-flea, these and other things are all inherited, and in approximately the same manner. Nay, if we extend the notion of like producing like, we shall find, as I have recently done, that the same laws are probably true for the mushroom and for the forest tree; that the principle of heredity runs with certainly no weakened intensity from the

lowest to the highest organisms, and from their least to their most important characters.

Now, let us try to understand exactly what this means. Of a definite child of A and B we can assert nothing with certainty, but of all the children of a definite class of parents like A and B we can assert that a definite proportion will have a definite amount of any character of A and B with a certainty as great as that of any scientific prediction whatever. I am not speaking from belief or from theory, but simply from facts, from thousands of instances recorded by my fellow-workers or myself. Here is a great principle of life, something apparently controlling all life from its simplest to its most complex forms, and yet, although we too often see its relentless effects, we go on hoping that at any rate we and our offspring shall be the exceptions to its rules. For one of us as an individual this may be true, but for the *average* of us all, for the nation as a whole, it is an idle hope. You cannot change the leopard's spots, and you cannot change bad stock to
d; you may dilute it, possibly spread it

over a wider area, spoiling good stock, but until it ceases to multiply it will not cease to be. A physically and mentally well-ordered individual will arise as a variation in bad stock, or possibly may result from special nurture, but the old evils will in all probability reappear in a definite percentage of the offspring.

I know of the case of just such a good variation appearing in a certain bad stock as far back as 1680, and the offspring of which married in the early eighteenth century into a number of good stocks, several of which we can trace in the records of the religious community of which they were members for nearly 150 years. And what do we find? In each generation the same sort of proportion of cases of drunkenness, insanity, and physical breakdown arising to distress and perplex their kinsfolk.

Now, if we once realize that this law of inheritance is as inevitable as the law of gravity, we shall cease to struggle against it. This does not mean a fatal resignation to the presence of bad stock, but a conscious attempt to modify the percentage of it in our

own community and in the world at large. Let me illustrate what I mean. A showman takes a wolf and, by aid of training and nurture, a more or less judicious administration of food and whip, makes it apparently docile and friendly as a dog. But one day, when the whip is not there, it is quite possible that the wolf will turn upon its keeper, or upon somebody else. Even if it does not, its offspring will not benefit by the parental education. I don't believe that the showman's way can be a *permanent* success; I believe, however, that you might completely domesticate the wolf, as the dog has been domesticated, by steadily selecting the more docile members of the community through several generations, and breeding only from these, rejecting the remainder. Now, if you have once realized the force of heredity, you will see in natural selection—that choice of the physically and mentally fitter to be the parents of the next generation — a most munificent provision for the progress of all forms of life. Nurture and education may immensely aid the social machine, but they must be repeated generation by generation;

they will not in themselves reduce the tendency to the production of bad stock. Conscious or unconscious selection can alone bring that about.

What I have said about bad stock seems to me to hold for the lower races of man. How many centuries, how many thousands of years, have the Kaffir and the Negro held large districts in Africa undisturbed by the white man? Yet their inter-tribal struggles have not yet produced a civilization in the least comparable with the Aryan. Educate and nurture them as you will, I do not believe that you will succeed in modifying the stock. History shows me one way, and one way only, in which a high state of civilization has been produced, namely, the struggle of race with race, and the survival of the physically and mentally fitter race. If you want to know whether the lower races of man can evolve a higher type, I fear the only course is to leave them to fight it out among themselves, and even then the struggle for existence between individual and individual, between tribe and tribe, may not be supported by that physical selection due to a

particular climate on which probably so much of the Aryan's success depended.

If you bring the white man into contact with the black, you too often suspend the very process of natural selection on which the evolution of a higher type depends. You get superior and inferior races living on the same soil, and that co-existence is demoralizing for both. They naturally sink into the position of master and servant, if not admittedly or covertly into that of slave-owner and slave. Frequently they intercross, and if the bad stock be raised the good is lowered. Even in the case of Eurasians, of whom I have met mentally and physically fine specimens, I have felt how much better they would have been had they been pure Asiatics or pure Europeans. Thus it comes about that when the struggle for existence between races is suspended, the solution of great problems may be unnaturally postponed; instead of the slow, stern processes of evolution, cataclysmal solutions are prepared for the future. Such problems in suspense, it appears to me, are to be found in the negro population of the Southern States of America, in the large ad-

mixture of Indian blood in some of the South American races, but above all, in the Kaffir factor in South Africa.

You may possibly think that I am straying from my subject, but I want to justify natural selection to you. I want you to see selection as something which renders the inexorable law of heredity a source of progress, which produces the good through suffering, an infinitely greater good which far outbalances the very obvious pain and evil. Let us suppose the alternative were possible. Let us suppose we could prevent the white man, if we liked, from going to lands of which the agricultural and mineral resources are not worked to the full; then I should say a thousand times better for him that he should not go than that he should settle down and live alongside the inferior race. The only healthy alternative is that he should go, and completely drive out the inferior race. That is practically what the white man has done in North America. We sometimes forget the light that chapter of history throws on more recent experiences. Some 250 years ago there was a man who fought in our country

against taxation without representation, and another man who did not mind going to prison for the sake of his religious opinions. As Englishmen we are proud of them both, but we sometimes forget that they were both considerable capitalists for their age, and started chartered companies in another continent. Well, a good deal went on in the plantations they founded, if not with their knowledge, with that at least of their servants and of their successors, which would shock us at the present day. But I venture to say that no man calmly judging will wish either that the whites had never gone to America, or would desire that whites and Red Indians were to-day living alongside each other as negro and white in the Southern States, as Kaffir and European in South Africa, still less that they had mixed their blood as Spaniard and Indian in South America. The civilization of the white man is a civilization dependent upon free white labour, and when that element of stability is removed it will collapse like those of Greece and Rome. I venture to assert, then, that the struggle for existence between white

and red man, painful and even terrible as it was in its details, has given us a good far outbalancing its immediate evil. In place of the red man, contributing practically nothing to the work and thought of the world, we have a great nation, mistress of many arts, and able, with its youthful imagination and fresh, untrammelled impulses, to contribute much to the common stock of civilized man. Against that you have only to put the romantic sympathy for the Red Indian generated by the novels of Cooper and the poems of Longfellow, and then—see how little it weighs in the balance!

But America is but one case in which we have to mark a masterful human progress following an inter-racial struggle. The Australian nation is another case of a great civilization supplanting a lower race unable to work to the full the land and its resources. Further back in history you find the same tale with almost every European nation. Sometimes when the conquering race is not too diverse in civilization and in type of energy there is an amalgamation of races, as when Norman and Anglo-Saxon ultimately blended; at

other times the inferior race is driven out before the superior, as the Celt drove out the Iberian. The struggle means suffering, intense suffering, while it is in progress; but that struggle and that suffering have been the stages by which the white man has reached his present stage of development, and they account for the fact that he no longer lives in caves and feeds on roots and nuts. This dependence of progress on the survival of the fitter race, terribly black as it may seem to some of you, gives the struggle for existence its redeeming features; it is the fiery crucible out of which comes the finer metal. You may hope for a time when the sword shall be turned into the ploughshare, when American and German and English traders shall no longer compete in the markets of the world for their raw material and for their food supply, when the white man and the dark shall share the soil between them, and each till it as he lists. But, believe me, when that day comes, mankind will no longer progress; there will be nothing to check the fertility of inferior stock; the relentless law of heredity will not be controlled and guided

by natural selection. Man will stagnate; and unless he ceases to multiply, the catastrophe will come again; famine and pestilence, as we see them in the East, physical selection instead of the struggle of race against race, will do the work more relentlessly, and, to judge from India and China, far less efficiently than of old.

Let us face this question of increasing population boldly. We cannot escape it. Sooner or later it must and will make itself felt in every progressive nation; for what I have said of the struggle of race against race makes itself again felt within every community. A nation like the French can largely limit the number of its offspring, but how shall we be sure that these offspring are from the better and not from the inferior stock? If they come equally from both stocks and there be no wastage, then the nation has ceased to progress; it stagnates. I feel sure that a certain amount of wastage is almost necessary for a progressive nation; you want definite evidence that the inferior stocks are not able to multiply at will, that a certain standard of physique and brains are needful

to a man if he wishes to settle and have a family.

Mr. Francis Galton has suggested that we might progress far more rapidly than we at present do under this crude system of unconscious wastage if we turned our thoughts more consciously to the problem, if we emphasized the need of social action in this direction, and made men and women feel the importance of good parentage for the citizens of the future. But I fear our present economic and social conditions are hardly yet ripe for such a movement; the all-important question of parentage is still largely felt to be solely a matter of family, and not of national importance. Yet, how anti-social such a view may be can be easily realized. From the standpoint of the nation we want to inculcate a feeling of shame in the parents of a weakling, whether it be mentally or physically unfit. We want parents to grasp that they have given birth to a new *citizen*, and that this involves, on the one hand, a duty towards the community in respect of his breed and nurture, and a claim, on the other hand, of the parents on the

State, that the latter shall make the conditions of life favourable to the rearing of healthy, mentally vigorous men and women. Bear in mind that one quarter only of the married people of this country—say, a sixth to an eighth of the adult population—produce 50 per cent. of the next generation. You will then see how essential it is for the maintenance of a physically and mentally fit race that this one-sixth to one-eighth of our population should be drawn from the best and not the worst stocks. A nation that begins to tamper with its fertility may unconsciously have changed its national characteristics before two generations have passed.

France is becoming a land of Bretons because the Bretons alone have large families. And what about England? Our birth-rate has been going down for, perhaps, thirty years. Who will venture to assert that this decreased fertility has occurred in the inferior stocks? On the contrary, is it not the feckless and improvident who have the largest families? The professional classes, the trading classes, the substantial and provident working classes —shortly, the capable elements of the com-

munity with a certain standard of life—have been marrying late, have been having small families, have been increasing their individual comfort, and all this is at the expense of the nation's future. We cannot suspend the struggle for existence in any class of the community without stopping progress; we cannot recruit the nation from its inferior stocks without deteriorating our national character.

Now, what have our economic conditions in England been during the last thirty years? The accumulation of wealth has been such at one end of society that no test of brains or of physique was needful before a man multiplied his type. Death, duties and the inherent tendency of folly to squander its substance were only very inefficient, very partial, checks on the endowment in perpetuity of the brainless. At the other end of society we allowed a condition of affairs to exist in which no greater discomfort could well be produced by the introduction of additional human beings; there were always charity and the State ready to provide, more or less inefficiently, for the surplus population. There has been scarcely any check on

the multiplication of inferior stock; only in the middle ranks, among the more substantial workers with the hand and the head, have men regarded the number of their offspring and made success in life's struggle to some extent a condition of their multiplication.

Now, surely this is a very dangerous state of affairs for the nation at large. A crisis may come in which we may want all the brain and all the muscle we can possibly lay our hands on, and we may find that there is a dearth of ability and a dearth of physique, because we have allowed inferior stock to multiply at the expense of the better. There are occasions when a nation wants a reserve of strong men, and when it must draw brain and muscle from classes and from forms of work wherein they are not exercised to the full. And in that day woe to the nation which has recruited itself from the weaker and not from the stronger stocks! If you have not the means to start all your offspring in your own class, let them do the work of another; if you cannot make them into lawyers and engineers, let them be village school-

masters and mechanics. Or, if this should raise an insurmountable, if utterly false, shame, let them go to new lands even as miners, cowboys, and storekeepers; they will strengthen the nation's reserve, and this is far better than that they should never have existed at all.

I will not say that we have a dearth of ability and of physique at this time, but I will venture to assert that there has, of recent years, been a want of them in the right places, and that last year, but for the reserve of strong men in our colonies, we should have been in far greater difficulties than we were. It is not only in warfare—that is the crudest form of the modern struggle of nations—but in manufacture and in commerce that there has been a want of brains in the right place. Leadership in trade is really no more than leadership in the army open to the man of brains; in both cases it becomes a question of wealth; the endowed but brainless get the start. Consider, again, how the led are, in many cases, not the mentally and physically best for the task; they are too often the surplus of the inferior stocks. What wonder

when we put the one in competition with the brains and training of the German commercial and technical houses we meet defeat! What wonder that, when we take the other out of its environment, the leaders cannot lead, and the led fall an easy prey to sickness and disease? The regiment which has marched farthest and has marched quickest, which has suffered little from disease and fought as well as any in the Transvaal, is a volunteer regiment, drawn from that very reserve of strength in the better stocks to which I have referred.

In industry it is the same thing. We shall do no good against the American and the German by a mere multiplication of centres of technical instruction. What we want to do is to bring brains into our industry from top to bottom. Where the brains already exist, there training will work wonders; but we shall not make the product of inferior stock capable men by merely teaching them the tricks of their trade. In one polytechnic I found lads learning how to fold cretonnes and polish mahogany; that is to say, the manufacturers had thrust the

cost of apprenticeship on the public purse, perhaps to some extent lowering the price of sofas and easy-chairs to those who care about them. The object of any technical education paid for by the State or the municipality should be the exercise of brain-power, mental gymnastics in the best sense; it should treat of the science, and not the art, of a trade. Such education—education, remember, means literally a *drawing out*, not a cramming in—ought to act as a brain-stretcher, and not attempt to communicate mere trade knowledge. Where it does the latter—and in how many cases does it not, under our brand-new system of technical instruction?—then it is merely relieving the manufacturers, and possibly the purchasers, of certain goods of such part of their cost as has hitherto been paid for apprenticeship. On the other hand, when technical education acts as a brain-stretcher, then this increased efficiency tells not only on the trade occupations, but on the social and civic life of the educated; the nation is thereby strengthening the reserve of trained brains upon which it can draw in a crisis for all sorts of other

functions than those of a narrow trade. Brain-stretching fosters an adaptability to new environments. This is something very different to a more complete knowledge of trade processes or to proficiency in a special handicraft. This is a form of education for which the nation may legitimately pay; it is that which is essential to it in the struggle for existence.

I am not speaking without some experience. I have been engaged for sixteen years in helping to train engineers, and those of my old pupils who are now coming to the front in life are not those who stuck to facts and formulæ, and sought only for what they thought would be 'useful to them in their profession.' On the contrary, the lads who paid attention to method, who thought more of proofs than of formulæ, who accepted even the specialized branches of their training as a means of developing habits of observation rather than of collecting 'useful facts,' these lads have developed into men who are succeeding in life. And the reason of this seems to me, when considering their individual cases, to be that they could adapt themselves

to an environment more or less different from that of the existing profession; they could go beyond its processes, its formulæ, and its facts, and develop new ones. Their knowledge of method and their powers of observation enabled them to supply new needs, to answer to the call when there was a demand, not for old knowledge, but for trained brains.

Here, I think, is the point where we reach the second great function of science in national life. The first function is to show us what national life means, and how the nation is a vast organism subject as much to the great forces of evolution as any other gregarious type of life. There is a struggle of race against race and of nation against nation. In the early days of that struggle it was a blind, unconscious struggle of barbaric tribes. At the present day, in the case of the civilized white man, it has become more and more the conscious, carefully directed attempt of the nation to fit itself to a continuously changing environment. The nation has to foresee how and where the struggle will be carried on; the maintenance of

national position is becoming more and more a conscious preparation for changing conditions, an insight into the needs of coming environments.

This is the second important duty of science in relation to national life. It has to develop our brain-power by providing a training in method and by exercising our powers of cautious observation. It has to teach not only the leaders of our national life, but the people at large, to prepare for and meet the difficulties of new environments. This is the only sort of technical education the nation ought to trouble about, the teaching people to see and to think. It is not the art of a particular trade which we want to teach in the schools, but the power of observing and reasoning upon observation.

There is a most simple description of true science which is embraced in the words: *Keep your eyes open and apply common-sense.* That is the keynote to the conduct of the geologist who has roughly sketched the history of many thousand years as he walked across the downs with you, of the engineer who rapidly reports on a new country, of

the doctor who forms rapid diagnoses as he paces the hospital ward; it is trained observation applied to physical and human nature. There is a very excellent little book which many of you may have read recently, Baden-Powell's 'Aids to Scouting'; it is a capital introduction to the true scientific method. The man with a scientific training *scouts* through Nature, including under nature mankind itself. You may sum up his conduct just as I think Baden-Powell's booklet may be summed up —*Keep your eyes open and apply common-sense.* What we as a nation seem to want at the present time is precisely what Sir Redvers Buller complained of our army needing in Natal—*scouting.* I take it that the success of German technical instruction is just proportional to its efficiency in producing trained scouts. We have only just started our technical schools, but I sadly fear they are not putting sufficient stress on scouting, on teaching how to observe and how to reason, on observation as distinct from a knowledge of facts, from a training in handicraft. Mechanical skill, the trick

of the trade, may be learnt best in the workshop; facts and formulæ may be found in books; processes followed in the foundry and the weaving-shed in a manner that can only be mimicked in the schools; but true scouting can be learnt only from the master-scout. And here arises the real value of a band of men trained to observe and reason. This is why we want scientific schools and men of science if the nation is to maintain its position.

If you turn in almost any direction, you will see this want of trained scouts. We want them in our diplomatic service to keep their hand on the pulse of other nations; we want them in new countries to tell us of new mineral and new food supplies; we want them, above all, in our trade, to tell us what to make and how and where to send it; we want them to see what competitive nations are doing, and to provide for our mercantile marine, our railways, our manufactures being maintained at the highest state of efficiency. Shortly, we want scouting in all branches of the national service; we need men who will observe what others are doing, who will seek

for new supplies, and push the nation and prepare cautiously for its advance in every way.

I will not underrate the importance of the equipment of the scout. He undoubtedly profits by technical knowledge. You cannot send a man to push trade if he have no knowledge of the language of the people he has to deal with, or an engineer to discover mineral resources without an elementary acquaintance with geology. But I insist that the trained mind is the first thing, and for scouting a fool on horseback is worth less than a wise man on foot. We are a wealthy nation, and I fear we find it easier to provide the equipment than to discover the master-scout. I have yet to learn that the physicist with palatial laboratory and elaborate and costly implements will do more for his pupils than the man with no instrument-maker behind him. The biologist with his £80 microscopes and specimens drawn from the four quarters of the globe may teach less than the field naturalist with the hedgerow and the lens. One of the first lessons of scouting is independence of equipment, the

doing of great things with small means; and magnificent equipment, the provision of elaborate instruments and highly-trained mechanicians, too often renders your man of science and his pupils helpless in a less palatial environment. We are not going to get technical education by merely paying for it. You may show wonderful buildings, dazzling equipments, a network of examinations, and a crowd of certificated examinees, but this will not insure the training the nation wants in observation and in reasoning on observation.

We must, above all, exercise the selective faculty and choose true master-scouts, giving them a free hand, and they will teach our lads to observe and think scientifically. That is the only form of technical education which will produce the scouting power the nation needs. Some may say that this is pure science, and not technical instruction at all. I am not prepared to say it is not. I don't care a rap, and don't believe anyone with educational interests at heart does care a rap, for the facts and formulæ and results of science being crammed into all classes of the

community; they may be useful enough to men of special trades and professions. But what the nation does want in order to strengthen its civil and commercial life is a great increase in its powers of observation, in its knowledge of scientific method and of the nature of scientific reasoning. The rest, the greater efficiency in trade and handicraft, will follow surely enough on that. Make the man *intellectually* stronger, and he will be a better soldier, a better trader, and a better craftsman. Teach the man how to scout in the first place, and then he will know for himself the sort of equipment he wants and how it is to be provided. You furnish a charger and a sword, where peradventure a pony and a hatchet are what the trained scout would select for himself. Knowledge is the equipment which the trained mind can find for itself, but the training is a thing you have got to provide for it, and the national value of science lies first in the training it can furnish, and only in the second place in its practical results.

There has been far too much talk about the national utility of science, and too little

stress laid on its educational value. 'I want my son to learn what will be useful to him in his profession in life' is the statement I have heard from one parent after another. 'I want my son to know how to observe and to think,' is the expression of a desire which I have not yet come across. This is the spirit which has ruled the movement for technical education; but if this spirit is to remain dominant, it will take a great deal to get the nation out of the present ruts. What we want are trained brains, scouts in all fields, and not a knowledge of facts and processes crammed into a wider range of untrained minds.

It may be as well now to sum up my position as far as I have yet developed it. I have asked you to look upon the nation as an organized whole in continual struggle with other nations, whether by force of arms or by force of trade and economic processes. I have asked you to look upon this struggle of either kind as a not wholly bad thing; it is the source of human progress throughout the world's history. But if a nation is to maintain its position in this struggle, it must

be fully provided with trained brains in every department of national activity, from the government to the factory, and have, if possible, a *reserve of brain and physique* to fall back upon in times of national crisis. Recent events in our commercial as well as in our military experience have led some to doubt whether our supply of trained brains is sufficient, or, at any rate, whether it is available in the right place at the right moment. Those presumably who hold that the brains are forthcoming have raised the cry of technical instruction, which is to be a remedy for our commercial difficulties. I have little doubt that when this war is finished the cry of military instruction will be raised for our army difficulties. In the latter as in the former case large sums of money will no doubt be demanded for equipment. But I have endeavoured to indicate that there are two preliminary matters to be considered. First, are we quite certain that we have a reserve of brain power ready to be trained? We have to remember that man is subject to the universal law of inheritance, and that a dearth of capacity may

arise if we recruit our society from the inferior and not the better stock. If any social opinions or class prejudices tamper with the fertility of the better stocks, then the national character will take but a few generations to be seriously modified. The pressure of population should always tend to push brains and physique into occupations where they are not a primary necessity, for in this way a reserve is formed for the times of national crisis. Such a reserve can always be formed by filling up with men of our own kith and kin the waste lands of the earth, even at the expense of an inferior race of inhabitants. Yet if we grant that our nation has a full supply of brains both in action and in reserve, it is not knowledge in the first place, but intellectual training, which is requisite. We want the master-scout to teach men to observe and reason on their observations, and the equipment of the scout, the actual knowledge of facts and processes, is a minor matter.

You will see that my view—and I think it may be called the scientific view of a nation—is that of an organized whole, kept up to a

high pitch of internal efficiency by insuring that its numbers are substantially recruited from the better stocks, and kept up to a high pitch of external efficiency by contest, chiefly by way of war with inferior races, and with equal races by the struggle for trade-routes and for the sources of raw material and of food supply. This is the natural history view of mankind, and I do not think you can in its main features subvert it. Some of you may refuse to acknowledge it, but you cannot really study history and refuse to see its force. Some of you may realize it, and then despair of life; you may decline to admit any glory in a world where the superior race must either eject the inferior, or, mixing with it or even living alongside it, degenerate itself. What beauty can there be when the battle is to the stronger, and the weaker must suffer in the struggle of nations and in the struggle of individual men? You may say: Let us cease to struggle, let us leave the lands of the world to the races that cannot profit by them to the full, let us cease to compete in the markets of the world. Well, we could do it, if we were a small nation living on the

produce of our own soil, and a soil so worthless that no other race envied it and sought to appropriate it. We should cease to advance; but then we should naturally give up progress as a good which comes through suffering. I say it is possible for a small rural community to stand apart from the world-contest and to stagnate, if no more powerful nation wants its possessions.

But are we such a community? Is it not a fact that the daily bread of our millions of workers depends on their having somebody to work for? that if we give up the contest for trade-routes and for free markets and for waste lands, we indirectly give up our food-supply? Is it not a fact that our strength depends on these and upon our colonies, and that our colonies have been won by the ejection of inferior races, and are maintained against equal races only by respect for their and our present power? If war or competition lessen the China trade, if a bad harvest or a flood check the import of Egyptian or American cotton, it is the Lancashire operative who feels the pinch. The day when we cease to hold our own among the nations will be the

day of catastrophe for our workers at home. We could return to the condition of medieval England, to the condition of Norway or Denmark, but only by a process of intense selection, reducing our millions in a manner which the imagination refuses to contemplate. Being as we are, we cannot give up the struggle, and the moment dearth of ability, the want of brains and physique in the right place, leads to serious defeat, our catastrophe will come. That is the vision which depressed thoughtful men at the beginning of this year; that is the dread which must be ever in the mind of the true statesman when he seeks, on the one hand, to curb the rash venture which may overstrain our power, and on the other hand, to maintain our right to work the unutilized resources of earth, be they in Africa or in Asia.

Struggle of race against race, and of man against man—if this be the scientific view of life, the basis of human progress—how have human love and sympathy come to play such a great part in the world? Here, again, I think science has something to say, although the earlier interpreters of evolution rather

obscured it. They painted evolution as the survival of the fittest *individual*, and spoke of his struggle against his *fellows*.

But this is not the only form of selection at work; it is often quite the least effective phase of the contest. Consciously or unconsciously, one type of life is fighting against a second type, and all life is struggling with its physical environment. The safety of a gregarious animal—and man is essentially such—depends upon the intensity with which the social instinct has been developed. The stability of a race depends entirely on the extent to which the social feelings have got a real hold on it. The race, which allows the physically or mentally stronger Tom to make the existence of the somewhat inferior Jack impossible, will never succeed when it comes into contest with a second race. Jack has no interests in common with Tom; the oppressed will hardly get worse terms from a new master. That is why no strong and permanent civilization can be built upon slave labour, why an inferior race doing menial labour for a superior race can give no stable community; that is why we shall

never have a healthy social state in South Africa until the white man replaces the dark in the fields and in the mines, and the Kaffir is pushed back towards the equator. The nation organized for the struggle must be a *homogeneous* whole, not a mixture of superior and inferior races. For this reason every new land we colonize with white men is a source of strength; every land of coloured men we simply rule may be needful as a source of food and mineral wealth, but it is not an element of stability to our community, and must ever be regarded with grave anxiety by our statesmen.

This need for homogeneity in a nation may be pushed further. You must not have class differences and wealth differences and education differences so great within the community that you lose the sense of common interest, and feel only the pressure of the struggle of man against man. No tribe of men can work together unless the tribal interest dominates the personal and individual interest at all points where they come into conflict. The struggle among primitive man of tribe against tribe evolved the social

instinct. The tribe with the greater social feeling survived; we have to thank the struggle for existence for first making man gregarious, and then intensifying, stage by stage, the social feeling. Such is the scientific account of the origin of our social instincts; and if you come to analyze it such is the origin of what we term morality; morality is only the developed form of the tribal habit, the custom of acting in a certain way towards our fellows, upon which the very safety of the tribe originally depended. Philosophies may be invented, the supersensuous appealed to, in order to increase the sanctions on social or moral conduct; but the natural history of morality begins with the kin, spreads to the tribe, to the nation, to allied races, and ultimately to inferior races and lower types of life, but ever with decreasing intensity. The demands upon the spirit of self-sacrifice which can be made by our kin, by our countrymen, by Europeans, by Chinamen, by Negroes, and by Kaffirs, by animals, may not be clearly defined; but, on the average, they admit of rough graduation, and we find in practice, whatever be our fine philosophies, that the instinct to

self-sacrifice wanes as we go down in the scale.

The man who tells us that he feels to all men alike, that he has no sense of kinship, that he has no patriotic sentiment, that he loves the Kaffir as he loves his brother, is probably deceiving himself. If he is not, then all we can say is that a nation of such men, or even a nation with a large minority of such men, will not stand for many generations; it cannot survive in the struggle of the nations, it cannot be a factor in the contest upon which human progress ultimately depends. The national spirit is not a thing to be ashamed of, as the educated man seems occasionally to hold. If that spirit be the mere excrescence of the music-hall, or an ignorant assertion of superiority to the foreigner, it may be ridiculous, it may even be nationally dangerous; but if the national spirit takes the form of a strong feeling of the importance of organizing the nation as a whole, of making its social and economic conditions such that it is able to do its work in the world and meet its fellows without esitation in the field and in the market, then

it seems to me a wholly good spirit—indeed, one of the highest forms of social, that is, moral instinct.

So far from our having too much of this spirit of patriotism, I doubt if we have anything like enough of it. We wait to improve the condition of some class of workers until they themselves cry out or even rebel against their economic condition. We do not better their state because we perceive its relation to the strength and stability of the nation as a whole. Too often it is done as the outcome of a blind class war. The coal-owners, the miners, the manufacturers, the mill-hands, the landlords, the farmers, the agricultural labourers, struggle by fair means, and occasionally by foul, against each other, and, in doing so, against the nation at large, and our statesmen as a rule look on. That was the correct attitude from the standpoint of the old political economy. It is not the correct attitude from the standpoint of science; for science realizes that the nation is an organized whole, in continual struggle with its competitors. You cannot get a strong and effective nation if many of

its stomachs are half fed and many of its brains untrained. We, as a nation, cannot survive in the struggle for existence if we allow class distinctions to permanently endow the brainless and to push them into posts of national responsibility. The true statesman has to limit the internal struggle of the community in order to make it stronger for the external struggle. We must reward ability, we must pay for brains, we must give larger advantage to physique; but we must not do this at a rate which renders the lot of the mediocre an unhappy one. We must foster exceptional brains and physique for national purposes; but, however useful prize-cattle may be, they are not bred for their own sake, but as a step towards the improvement of the whole herd.

If I have put my position at all clearly, you will see how the key to it lies in the *gregarious* nature of man. The older evolutionists overlooked several of the factors of the struggle for existence. They emphasized, in a way which now appears almost absurd, the struggle of individual with individual. They do not appear to have

Lec Kropotkin, Mutual Aid

recognised that many of the characters which give man his foremost place in the animal kingdom were evoked in the struggle of tribe against tribe, of race against race, and even of man as a whole against other forms of life and against his physical environment. Like the older political economists, they thought all real progress depended upon an all-round fight within the community. They forgot that the herd exists owing to its social instincts, and that human sympathy and racial and national feelings are strong natural forces controlling individual conduct and economic theories based purely on questions of supply and demand. It is the herd, the tribe, or the nation which forms the fundamental unit in the evolution of man, and it is to the leaders of the herd, or nation, that we ought to look for conscious recognition of this fact.

If they are true statesmen, they ought not merely to advance in the direction they may be pushed by the immediate needs of one overburdened class, or by the overloud cry of another for the time being dominant group; they ought to look upon the community as

an organized whole, and treat class needs and group cries from the standpoint of the efficiency of the herd at large. Their duty is to lessen, if not to suspend, the internal struggle, that the nation may be strong externally. One point only is fundamental in that suspension of the internal struggle, and this holds for man as for every gregarious animal; social sympathy and State aid must not be carried so far within the community that the intellectually and physically weaker stocks multiply at the same rate as the better stocks.

The dearth of brains and the dearth of physique are the worst misfortunes that can befall a nation, and yet how many of our rulers realize that brains and physique are not things scattered at random among the population, which they can lay their hands on whenever they need them? Our legislators get wonderfully excited over laws relating to horses and cattle; they devote money and time to breeding purposes, and realize the strength of the law of inheritance when they endow national studs and give prizes to encourage the maintenance of good stock, or

when again they work for the establishment of selected herds. But which of them has considered domestic legislation from the natural history standpoint? What statesman has remembered that in the character of the national fertility of to-day is written the strength or weakness of the nation to-morrow? I fear we leave these things to chance, to the caprice of individual selfishness. As long as the social conditions were such that the weak within the community were not protected by the State; as long as there was no restriction on the fertility of the better stocks, we might in a rough-and-ready manner trust that our population would be recruited from its fitter members. But with the social movements of the present day, the reduction in infantile mortality, principally of the inferior stocks, the reduction in the birth-rate, principally of the superior stocks, science may well call the attention of our rulers to a possible famine—a day when we shall want brains and want physique, and shall not find the necessary reserve of them.

Take the case of genius alone. Mr. Galton has shown us that it largely arises

from special stocks; but if those stocks decrease their output, then by so much does the rare chance of a man of genius appearing grow rarer. Again, I repeat, we may, after all, only want brains in the right place. But besides the need of them in South Africa, which was recently fairly manifest, look to any branch of national life, and may we not fear the dearth has already begun? Where are the young men in the political world who can stir even a small section of the community to united action? Where are the younger civil servants to replace our dying pro-consuls, and to whom the nation can commit with a feeling of security and confidence the future problems of South Africa? Where are the new writers to whom the nation listens as it did to Carlyle, Ruskin, and Browning? or for whose books it eagerly waits as for those of Thackeray and George Eliot? Where are the leaders of science who will make the epoch that Darwin and Huxley made in biology, or Faraday and Clerk Maxwell in physics? There may be steady average ability, but where is the fire of genius, the spirit of enthusiasm, which

creates the leader of men either in thought or action? Alas! it is difficult to see any light on the horizon predicting the dawn of an intellectual renaissance, or heralding social and political reforms such as carried the nation through the difficult fifty years of the middle of this century. Possibly our strong men may have got into the wrong places. Ability may have drifted on to the Stock Exchange, the race-course, or the cricket-field, for aught I can say to the contrary; but I must confess to feeling sometimes that an actual dearth is upon us. And if this should be so, then the unchangeable law of heredity shows us only too clearly the source: we have multiplied from the inferior, and not from the superior stocks.

I have laid special stress on this point, for I want to impress you with two aspects under which science is of national value. The one is as a great factor of education. On its facts and its formulæ I lay no weight; you will find them appraised—nay, overvalued—by the modern apostles of technical instruction. But education is not a communication of knowledge; it is a drawing out and an

exercising of brain power. Here science—true science, in the hands of the master-scout—can teach us to observe and infer from observation more readily and more effectively than perhaps any other form of mental discipline. It is the trained scout in all fields of our national activity that we need so badly.

The other aspect from which science claims national value is from the interpretation it puts upon the functions and the historical development of the community. It teaches us to examine the efficiency of the nation from the natural history standpoint. We find that the law of the survival of the fitter is true of mankind, but that the struggle is that of the gregarious animal. A community not knit together by strong social instincts, by sympathy between man and man, and class and class, cannot face the external contest, the competition with other nations, by peace or by war, for the raw material of production and for its food supply. This struggle of tribe with tribe, and nation with nation, may have its mournful side; but we see as a result of it the gradual progress of

mankind to higher intellectual and physical efficiency. It is idle to condemn it; we can only see that it exists and recognise what we have gained by it—civilization and social sympathy. But while the statesman has to watch this external struggle, to see that the nation is really an organized whole, not a loose agglomeration of hostile groups of men seeking primarily their own profit and pleasure at the national expense; while he has to check the internal struggle of man with man, he must be very cautious that the nation is not silently rotting at its core. He must insure that the fertility of the inferior stocks is checked, and that of the superior stocks encouraged; he must regard with suspicion anything that tempts the physically and mentally fitter men and women to remain childless. He must see to it that a reserve of brain and muscle is pushed down into occupations that have little apparent need of them, or forced into new lands—even at the expense of inferior races—for upon this reserve we shall surely have to fall back in times of crisis—and such crises will come in our lifetime, to judge by economic and

political history, which may far surpass in magnitude that of this year. Shortly, the statesman has to hold the balance between the strong social feelings upon which are based the external success of the nation and the crude natural check to the unlimited multiplication of the unfit upon which the internal soundness of the nation depends. That is the great lesson we must learn from natural selection and the law of inheritance as applied to human communities.

I have endeavoured to place before you a few of the problems which, it seems to me, arise from a consideration of some of our recent difficulties in war and in trade. Science is not a dogma; it has no infallible popes to pronounce authoritatively what its teaching is. I can only say how it seems to one individual scientific worker that the doctrine of evolution applies to the history of nations. My interpretation may be wrong, but of the true method I am sure: a community of men is as subject as a community of ants or as a herd of buffaloes to the laws which rule all organic nature. We cannot escape from them; it serves no purpose to protest at what

some term their cruelty and their bloodthirstiness. We can only study these laws, recognise what of gain they have brought to man, and urge the statesman and the thinker to regard and use them, as the engineer and inventor regard and then turn to human profit the equally unchangeable laws of physical nature.

The origin of the world and the purport of life are mysteries alike to the poet, the theologian, and the man of science. One who has stood somewhat as the mediator between the three admitted the mystery, saw the cruelty of natural processes when judged from the relative standpoint of man, but found therein an undefinable 'tendency towards righteousness.' If by righteousness he meant wider human sympathies, intenser social instincts, keener pity, and clearer principles of conduct, then I believe that tendency, that continual progress of mankind, is the scarcely recognised outcome of the bitter struggle of race with race, the result of man, like all other life, being subject to the stern law of the survival of the fitter, to the victory of the physically and mentally better organized. Mankind as a whole, like

the individual man, advances through pain and suffering only. The path of progress is strewn with the wreck of nations; traces are everywhere to be seen of the hecatombs of inferior races, and of victims who found not the narrow way to the greater perfection. Yet these dead peoples are, in very truth, the stepping-stones on which mankind has arisen to the higher intellectual and deeper emotional life of to-day.

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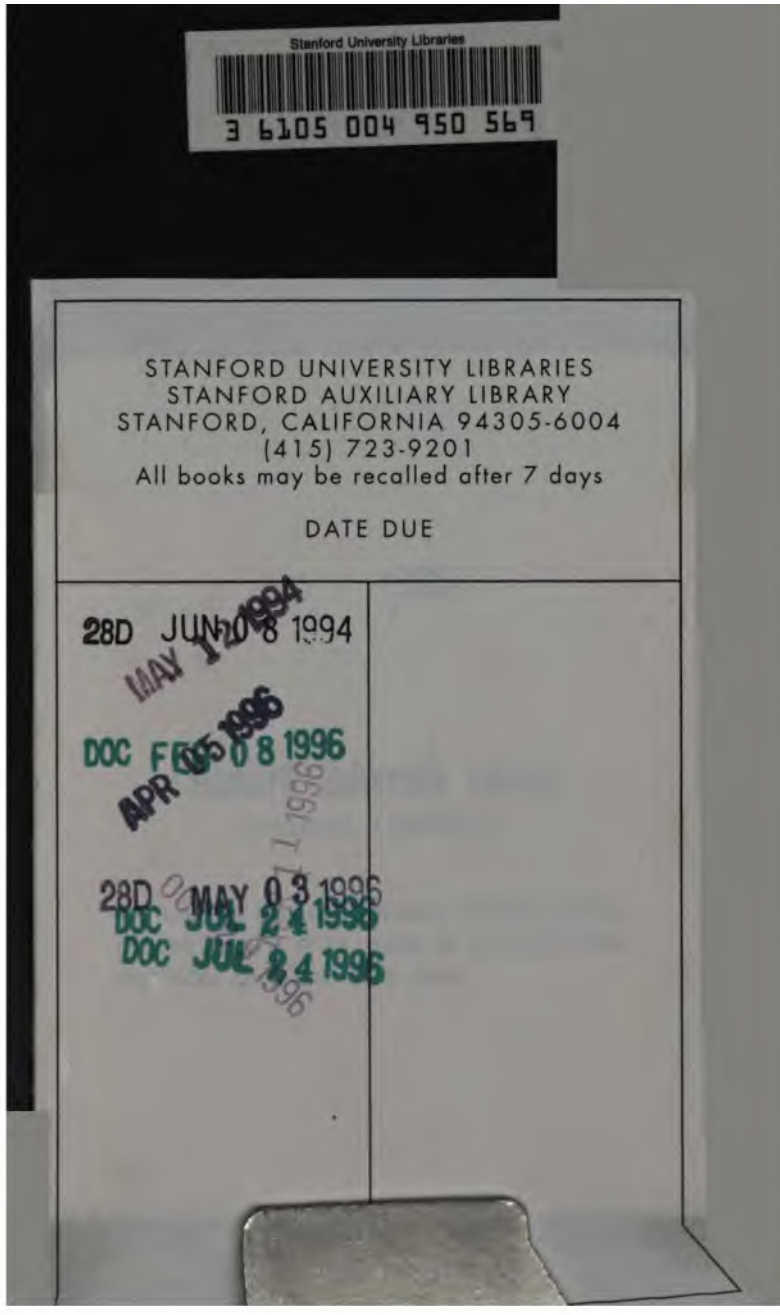
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